

Appl. No. 10/672,183
Amdt. dated August 29, 2007
Reply to Office Action of July 2, 2007

This listing of claims replaces all prior versions, and listings of claims in the instant application:

Listing of Claims:

1. (Currently Amended) A method for executing an obfuscated application program, the method comprising:
 - receiving an obfuscated application program, said obfuscated application program comprising at least one instruction opcode value encoded using one of a plurality of instruction set opcode value encoding schemes;
 - receiving an application program instruction corresponding to a current instruction counter value;
 - selecting an instruction dispatch table based at least on said current instruction counter value; and
 - executing said application program instruction using said selected instruction dispatch table to obtain a reference to an instruction implementation method corresponding to an the opcode value of the said application program instruction.

2. (Previously Presented) The method of claim 1, further comprising:

- determining whether there is another application program instruction to be executed;
 - advancing said current instruction counter if there is another application program instruction to be executed; and
 - repeating said receiving said application program instruction, said selecting and said executing after said advancing.

3. (Previously Presented) The method of claim 1 wherein said selecting further comprises:

- performing modulo-n arithmetic operation on said current instruction counter value, where n is the

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number of dispatch tables, each of said dispatch tables associated with a unique number between 0 and n-1; and selecting the instruction dispatch table associated with the result of said modulo-n arithmetic operation.

4. (Previously Presented) The method of claim 1 wherein the number of instruction dispatch tables is based at least on a number of instructions in a method of said obfuscated application program.

5. (Original) The method of claim 4 wherein said number of instruction dispatch tables is greater than or equal to said number of instructions.

6. (Original) The method of claim 5 wherein said number of instruction dispatch tables equals said number of instructions.

7. (Previously Presented) The method of claim 1 wherein the number of instruction dispatch tables is based at least on an amount of available memory.

8. (Previously Presented) A method for application program obfuscation, the method comprising:

reading an application program comprising code;
determining a plurality of dispatch tables associated with said application program;
transforming said application program into application program code configured to utilize said plurality of dispatch tables during application program execution to determine the location of instruction implementation methods to be executed based at least on using a current instruction counter value to select a dispatch table in said plurality of dispatch tables for use with an application program instruction

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corresponding to said current instruction counter value; and

sending said application program code.

9. (Previously Presented) The method of claim 8 wherein said determining further comprises determining the encoding of said plurality of dispatch tables based at least on a relative frequency of instructions in said application program code.

10. (Original) The method of claim 8 wherein said determining further comprises filtering said plurality of dispatch tables to flatten the frequency distribution of instructions over said transformed application program code.

11. (Original) The method of claim 8 wherein said method further comprises, after said transforming, applying a cryptographic process to said application program code together with a cryptographic key to create an encrypted obfuscated application program; and

said sending comprises sending said encrypted obfuscated application program.

12. (Currently Amended) A program storage device readable by a machine, embodying a program of instructions executable by the machine to perform a method for executing an obfuscated application program, the method comprising:

receiving an obfuscated application program, said obfuscated application program comprising at least one instruction opcode value encoded using one of a plurality of instruction set opcode value encoding schemes;

receiving an application program instruction corresponding to a current instruction counter value;

selecting an instruction dispatch table based at least on said current instruction counter value; and

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executing said application program instruction using said selected instruction dispatch table to obtain a reference to an instruction implementation method corresponding to an the opcode value of the said application program instruction.

13. (Previously Presented) The program storage device of claim 12, said method further comprising:

determining whether there is another application program instruction to be executed;

advancing said current instruction counter if there is another application program instruction to be executed; and

repeating said receiving said application program instruction, said selecting and said executing after said advancing.

14. (Previously Presented) The program storage device of claim 12 wherein said selecting further comprises:

performing modulo-n arithmetic operation on said current instruction counter value, where n is the number of dispatch tables, each of said dispatch tables associated with a unique number between 0 and n-1; and

selecting the instruction dispatch table associated with the result of said modulo-n arithmetic operation.

15. (Previously Presented) The program storage device of claim 12 wherein the number of instruction dispatch tables is based at least on a number of instructions in a method of said obfuscated application program.

16. (Original) The program storage device of claim 15 wherein said number of instruction dispatch tables is greater than or equal to said number of instructions.

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17. (Original) The program storage device of claim 16 wherein said number of instruction dispatch tables equals said number of instructions.

18. (Previously Presented) The program storage device of claim 12 wherein the number of instruction dispatch tables is based at least on an amount of available memory.

19. (Previously Presented) A program storage device readable by a machine, embodying a program of instructions executable by the machine to perform a method for application program obfuscation, the method comprising:

reading an application program comprising code;
determining a plurality of dispatch tables associated with said application program;
transforming said application program into application program code configured to utilize said plurality of dispatch tables during application program execution to determine the location of instruction implementation methods to be executed based at least on using a current instruction counter value to select a dispatch table in said plurality of dispatch tables for use with an application program instruction corresponding to said current instruction counter value; and

sending said application program code.

20. (Previously Presented) The program storage device of claim 19 wherein said determining further comprises determining the encoding of said plurality of dispatch tables based at least on a relative frequency of instructions in said application program code.

21. (Original) The program storage device of claim 19 wherein said determining further comprises filtering said plurality of dispatch tables to flatten the frequency

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distribution of instructions over said transformed application program code.

22. (Original) The program storage device of claim 19 wherein

said method further comprises, after said transforming, applying a cryptographic process to said application program code together with a cryptographic key to create an encrypted obfuscated application program; and

said sending comprises sending said encrypted obfuscated application program.

23. (Currently Amended) An apparatus for executing an obfuscated application program, the apparatus comprising:

means for receiving an obfuscated application program, said obfuscated application program comprising at least one instruction opcode value encoded using one of a plurality of instruction set opcode value encoding schemes;

means for receiving an application program instruction corresponding to a current instruction counter value;

means for selecting an instruction dispatch table based at least on said current instruction counter value; and

means for executing said application program instruction using said selected instruction dispatch table to obtain a reference to an instruction implementation method corresponding to an the opcode value of the said application program instruction.

24. (Previously Presented) The apparatus of claim 23, further comprising:

means for determining whether there is another application program instruction to be executed;

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means for advancing said current instruction counter if there is another application program instruction to be executed; and

means for repeating said receiving said application program instruction, said selecting and said executing after said advancing.

25. (Previously Presented) The apparatus of claim 23 wherein said means for selecting further comprises:

means for performing modulo-n arithmetic operation on said current instruction counter value, where n is the number of dispatch tables, each of said dispatch tables associated with a unique number between 0 and n-1; and

means for selecting the instruction dispatch table associated with the result of said modulo-n arithmetic operation.

26. (Previously Presented) The apparatus of claim 23 wherein the number of instruction dispatch tables is based at least on a number of instructions in a method of said obfuscated application program.

27. (Original) The apparatus of claim 26 wherein said number of instruction dispatch tables is greater than or equal to said number of instructions.

28. (Original) The apparatus of claim 27 wherein said number of instruction dispatch tables equals said number of instructions.

29. (Previously Presented) The apparatus of claim 23 wherein the number of instruction dispatch tables is based at least on an amount of available memory.

30. (Previously Presented) An apparatus for application program obfuscation, the apparatus comprising:

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a processor; and

a memory, coupled to said processor, having stored therein computer readable instructions wherein executing said computer readable instructions on said processor provides:

means for reading an application program comprising code;

means for determining a plurality of dispatch tables associated with said application program;

means for transforming said application program into application program code configured to utilize said plurality of dispatch tables during application program execution to determine the location of instruction implementation methods to be executed based at least on using a current instruction counter value to select a dispatch table in said plurality of dispatch tables for use with an application program instruction corresponding to said current instruction counter value; and

means for sending said application program code.

31. (Previously Presented) The apparatus of claim 30 wherein said means for determining further comprises means for determining the encoding of said plurality of dispatch tables based at least on a relative frequency of instructions in said application program code.

32. (Original) The apparatus of claim 30 wherein said means for determining further comprises filtering said plurality of dispatch tables to flatten the frequency distribution of instructions over said transformed application program code.

33. (Original) The apparatus of claim 30 wherein

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said apparatus further comprises, means for applying a cryptographic process to said application program code together with a cryptographic key to create an encrypted obfuscated application program in response to said transforming; and

said means for sending comprises means for sending said encrypted obfuscated application program.

34. (Currently Amended) An apparatus for executing an obfuscated application program, the apparatus comprising a user device configured to:

receive an obfuscated application program, said obfuscated application program comprising at least one instruction opcode value encoded using one of a plurality of instruction set opcode value encoding schemes;

receive an application program instruction corresponding to a current instruction counter value;

select an instruction dispatch table based at least on said current instruction counter value; and

execute said application program instruction using said selected instruction dispatch table to obtain a reference to an instruction implementation method corresponding to an the opcode value of the said application program instruction.

35. (Previously Presented) The apparatus of claim 34, said user device further configured to:

determine whether there is another application program instruction to be executed;

advance said current instruction counter if there is another application program instruction to be executed; and

repeat said receiving said application program instruction, said selecting and said executing after said advancing.

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36. (Previously Presented) The apparatus of claim 34 wherein said user device is further configured to:

perform modulo-n arithmetic operation on said current instruction counter value, where n is the number of dispatch tables, each of said dispatch tables associated with a unique number between 0 and n-1; and
select the instruction dispatch table associated with the result of said modulo-n arithmetic operation.

37. (Previously Presented) The apparatus of claim 34 wherein the number of instruction dispatch tables is based at least on a number of instructions in a method of said obfuscated application program.

38. (Original) The apparatus of claim 37 wherein said number of instruction dispatch tables is greater than or equal to said number of instructions.

39. (Original) The apparatus of claim 38 wherein said number of instruction dispatch tables equals said number of instructions.

40. (Previously Presented) The apparatus of claim 34 wherein the number of instruction dispatch tables is based at least on an amount of available memory.

41. (Previously Presented) An apparatus for application program obfuscation, the apparatus comprising an application program provider including a processor, and memory, coupled to said processor, having stored therein computer readable instructions wherein upon executing said computer readable instructions on said processor said application program provider is configured to:

read an application program comprising code;
determine a plurality of dispatch tables
associated with said application program;

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transform said application program into application program code configured to utilize said plurality of dispatch tables during application program execution to determine the location of instruction implementation methods to be executed based at least on use of a current instruction counter value to select a dispatch table in said plurality of dispatch tables for use with an application program instruction corresponding to said current instruction counter value; and

send said application program code.

42. (Previously Presented) The apparatus of claim 41 wherein said application program provider is further configured to determine the encoding of said plurality of dispatch tables based at least on a relative frequency of instructions in said application program code.

43. (Original) The apparatus of claim 41 wherein said application program provider is further configured to filter said plurality of dispatch tables to flatten the frequency distribution of instructions over said transformed application program code.

44. (Original) The apparatus of claim 41 wherein said application program provider is further configured to apply a cryptographic process to said application program code together with a cryptographic key to create an encrypted obfuscated application program; and

said application program provider is further configured to send said encrypted obfuscated application program.

45. (Previously Presented) A data processing system comprising:
a processor; and

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memory, coupled to said processor, for storing data for access by an application program being executed on said data processing system, said memory comprising:

a data structure stored in said memory, said data structure including information used by said application program to execute an obfuscated application program on said data processing system, said data structure comprising application program code configured to utilize a plurality of dispatch tables during execution of said obfuscated application program to determine a location of instruction implementation methods to be executed based at least on using a current instruction counter value to select a dispatch table in said plurality of dispatch tables for use with an application program instruction corresponding to said current instruction counter value.

46. (Currently Amended) The data processing system memory of claim 45 wherein said data structure further comprises a cryptographic key and protected data, said protected data encrypted using said cryptographic key.

47. (Currently Amended) The data processing system memory of claim 45 wherein said data structure further comprises an obfuscation descriptor that indicates an obfuscation method used to create said obfuscated application program.

48. (Previously Presented) A data processing system comprising:

a processor; and

memory, coupled to said processor, for storing data for access by an application program being executed on said data processing system, said memory comprising:

a data structure stored in said memory, said data structure including information used by said application program to execute an obfuscated

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application program, said data structure comprising a plurality of dispatch tables used during execution of said obfuscated application program to determine a location of instruction implementation methods to be executed based at least on using a current instruction counter value to select a dispatch table in said plurality of dispatch tables for use with an application program instruction corresponding to said current instruction counter value.

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